Monotonic, asymptotic, and divergent functions

Variables and constants

Powers and exponents

Local linearity

Domains: bounded and unbounded

Sums and integrals

Continuity, slope, and step functions

Variables and Constants

Constants can also be referred to as parameters

Common Functions:  
linear  
polynomial, rational, and power  
exponential (and logarithmic)  
periodic  
combination functions

Local Linearity

We are often justified in using a linear model, even when we know a relationship isn’t linear:

• If we are only interested in a small subset of the range of predictor values.

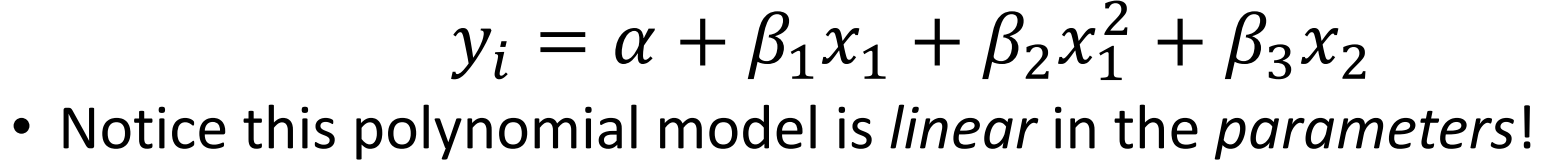
• All (most) continuous functions look very linear if you zoom in.

• Linear functions are much simpler than the rest of the functions we’ll consider.

Polynomial Models

Polynomial terms are sometimes added to models to improve the **model fit**

Typically phenomenological  
 Usually not a clear biological or ecological interpretation  
 Think of them as *tuning* parameters to increase model fit, or help with normality of the residuals



Rational functions

Polynomial functions are a subset of rational functions

Rational functions can be *discontinuous*: division by zero

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Typically used in phenomenological models  
Can emulate very complicated curves  
Tuning, improving normality of residuals, etc.  
Not used as often as polynomial or power law/fractional exponent functions

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Fractional or Real Number Exponents

Square root function is a fractional exponent

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They are often a result of *tuning* procedures like the Box-Cox transformation

Power vs Exponential Functions

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**Logarithmic Functions**

Applying a logarithmic function *undoes* an exponential function

Logarithmic functions are slow-growing, but *not asymptotic* (eventually will reach infinity)

Graphical user interface, diagram

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